# NL27WZ06

# Dual Inverter with Open Drain Outputs

The NL27WZ06 is a high performance dual inverter with open drain outputs operating from a 1.65 V to 5.5 V supply.

The internal circuit is composed of multiple stages, including an open drain output which provides the capability to set output switching level. This allows the NL27WZ06 to be used to interface 5.0 V circuits to circuits of any voltage between $V_{CC}$ and 7.0 V using an external resistor and power supply.

- Extremely High Speed: $t_{PD}$ 2.4 ns (typical) at $V_{CC}$ = 5.0 V
- Designed for 1.65 V to 5.5 V $V_{CC}$ Operation
- Over Voltage Tolerant Inputs
- LVTTL Compatible − Interface Capability With 5.0 V TTL Logic with $V_{CC}$ = 3.0 V
- LVCMOS Compatible
- 24 mA Output Sink Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 72; Equivalent Gate = 18
- Pb−Free Package is Available

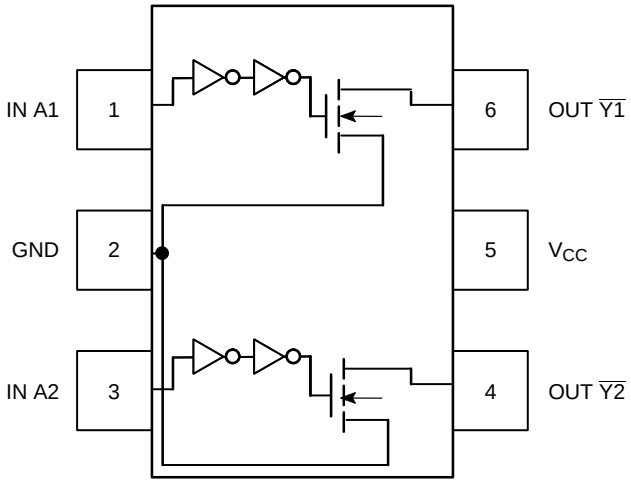



**Figure 1. Pinout** (Top View)

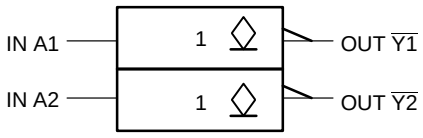


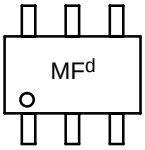

**Figure 2. Logic Symbol**

ON Semiconductor®

http://onsemi.com

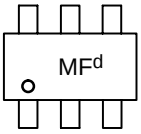
**MARKING DIAGRAMS**


**SC−88**
**DF SUFFIX**
**CASE 419B**




Pin 1
d = Date Code


**TSOP−6**
**DT SUFFIX**
**CASE 318G**




Pin 1
d = Date Code

**PIN ASSIGNMENT**

| | |
|---|---|
| 1 | IN A1 |
| 2 | GND |
| 3 | IN A2 |
| 4 | OUT $\overline{Y2}$ |
| 5 | $V_{CC}$ |
| 6 | OUT $\overline{Y1}$ |

**FUNCTION TABLE**

| A Input | $\overline{Y}$ Output |
|---|---|
| L | Z |
| H | L |

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

## MAXIMUM RATINGS

| Symbol | Characteristics | | Value | Unit |
|---|---|---|---|---|
| $V_{CC}$ | DC Supply Voltage | | −0.5 to +7.0 | V |
| $V_I$ | DC Input Voltage | | $-0.5 \le V_I \le +7.0$ | V |
| $V_O$ | DC Output Voltage | Output in Z or LOW State (Note 1) | $-0.5 \le V_O \le 7.0$ | V |
| $I_{IK}$ | DC Input Diode Current | $V_I$ < GND | −50 | mA |
| $I_{OK}$ | DC Output Diode Current | $V_O$ < GND | −50 | mA |
| $I_O$ | DC Output Sink Current | | ±50 | mA |
| $I_{CC}$ | DC Supply Current Per Supply Pin | | ±100 | mA |
| $I_{GND}$ | DC Ground Current Per Ground Pin | | ±100 | mA |
| $T_{STG}$ | Storage Temperature Range | | −65 to +150 | °C |
| $P_D$ | Power Dissipation in Still Air | SC−88, TSOP−6 | 200 | mW |
| $\theta_{JA}$ | Thermal resistance | SC−88, TSOP−6 | 333 | °C/W |
| $T_L$ | Lead temperature, 1 mm from case for 10 s | | 260 | °C |
| $T_J$ | Junction temperature under bias | | +150 | °C |
| $V_{ESD}$ | ESD Withstand Voltage | Human Body Model (Note 2)<br>Machine Model (Note 3)<br>Charged Device Model (Note 4) | > 2000<br>> 200<br>N/A | V |
| $I_{Latch-Up}$ | Latch−Up Performance | Above $V_{CC}$ and Below GND at 85°C (Note 5) | ±500 | mA |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. $I_O$ absolute maximum rating must be observed.
2. Tested to EIA/JESD22−A114−A
3. Tested to EIA/JESD22−A115−A
4. Tested to JESD22−C101−A
5. Tested to EIA/JESD78

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | Operating<br>Data Retention Only | 1.65<br>1.5 | 5.5<br>5.5 | V |
| $V_I$ | Input Voltage | | 0 | 5.5 | V |
| $V_O$ | Output Voltage | (Z or LOW State) | 0 | 5.5 | V |
| $T_A$ | Operating Free−Air Temperature | | −55 | +125 | °C |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate | $V_{CC}$ = 2.5 V ±0.2 V<br>$V_{CC}$ =3.0 V ±0.3 V<br>$V_{CC}$ =5.0 V ±0.5 V | 0<br>0<br>0 | 20<br>10<br>5 | ns/V |

## DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | $V_{CC}$ (V) | $T_A$ = 25°C | | | −40°C ≤ $T_A$ ≤ 85°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $V_{IH}$ | High−Level Input Voltage | | 1.65<br>2.3 to 5.5 | 0.75 $V_{CC}$<br>0.70 $V_{CC}$ | | | 0.75 $V_{CC}$<br>0.70 $V_{CC}$ | | V |
| $V_{IL}$ | Low−Level Input Voltage | | 1.65<br>2.3 to 5.5 | | | 0.25 $V_{CC}$<br>0.30 $V_{CC}$ | | 0.25 $V_{CC}$<br>0.30 $V_{CC}$ | V |
| $I_{LKG}$ | Z−State Output Leakage Current | $V_{IN}$ = $V_{IL}$<br>$V_{OUT}$ = $V_{CC}$ or GND | 1.65 to 5.5 | | | ±5.0 | | ±10.0 | μA |
| $V_{OL}$ | Low−Level Output Voltage<br>$V_{IN}$ = $V_{IH}$ | $I_{OL}$ = 100 μA | 1.65 to 5.5 | | 0.0 | 0.1 | | 0.1 | V |
| | | $I_{OL}$ = 3 mA | 1.65 | | 0.08 | 0.24 | | | |
| | | $I_{OL}$ = 8 mA | 2.3 | | 0.22 | 0.3 | | 0.3 | |
| | | $I_{OL}$ = 12 mA | 2.7 | | 0.22 | 0.4 | | 0.4 | |
| | | $I_{OL}$ = 16 mA | 3.0 | | 0.28 | 0.4 | | 0.4 | |
| | | $I_{OL}$ = 24 mA | 3.0 | | 0.38 | 0.55 | | 0.55 | |
| | | $I_{OL}$ = 32 mA | 4.5 | | 0.42 | 0.55 | | 0.55 | |
| $I_{IN}$ | Input Leakage Current | $V_{IN}$ or $V_{OUT}$ = $V_{CC}$ or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA |
| $I_{OFF}$ | Power Off−Output Leakage Current | $V_{OUT}$ = 5.5 V | 0 | | | 1 | | 10 | μA |
| $I_{CC}$ | Quiescent Supply Current | $V_{IN}$ = $V_{CC}$ or GND | 5.5 | | | 1 | | 10 | μA |

## AC ELECTRICAL CHARACTERISTICS $t_R$ = $t_F$ = 2.5 ns; $C_L$ = 50 pF; $R_L$ = 500 Ω

| Symbol | Parameter | Condition | $V_{CC}$ (V) | $T_A$ = 25°C | | | −40°C ≤ $T_A$ ≤ 85°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $t_{PZL}$ | Propagation Delay (Figure 3 and 4) | $R_L$ = $R_1$= 5000 Ω, $C_L$ = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 2.5 ± 0.20 | 0.8 | 3.0 | 3.6 | 0.8 | 4.1 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 3.3 ± 0.30 | 0.8 | 2.4 | 3.2 | 0.8 | 3.7 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 5.0 ± 0.50 | 0.5 | 2.4 | 3.0 | 0.5 | 3.5 | |
| $t_{PLZ}$ | Propagation Delay (Figure 3 and 4) | $R_L$ = $R_1$= 5000 Ω, $C_L$ = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 2.5 ± 0.20 | 0.8 | 3.0 | 3.6 | 0.8 | 4.1 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 3.3 ± 0.30 | 0.8 | 2.1 | 3.2 | 0.8 | 3.7 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 5.0 ± 0.50 | 0.5 | 1.2 | 3.0 | 0.5 | 3.5 | |

## CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{CC}$ = 5.5 V, $V_I$ = 0 V or $V_{CC}$ | 2.5 | pF |
| $C_{OUT}$ | Output Capacitance | $V_{CC}$ = 5.5 V, $V_I$ = 0 V or $V_{CC}$ | 4 | pF |
| $C_{PD}$ | Power Dissipation Capacitance (Note 6) | 10 MHz, $V_{CC}$ = 5.5 V, $V_I$ = 0 V or $V_{CC}$ | 4 | pF |

6. $C_{PD}$ is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. $C_{PD}$ is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

## DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | $V_{CC}$ (V) | $T_A$ = 25°C | | | −55°C ≤ $T_A$ ≤ 125°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $V_{IH}$ | High−Level Input Voltage | | 1.65<br>2.3 to 5.5 | 0.75 $V_{CC}$<br>0.70 $V_{CC}$ | | | 0.75 $V_{CC}$<br>0.70 $V_{CC}$ | | V |
| $V_{IL}$ | Low−Level Input Voltage | | 1.65<br>2.3 to 5.5 | | | 0.25 $V_{CC}$<br>0.30 $V_{CC}$ | | 0.25 $V_{CC}$<br>0.30 $V_{CC}$ | V |
| $I_{LKG}$ | Z−State Output Leakage Current | $V_{IN}$ = $V_{IL}$<br>$V_{OUT}$ = $V_{CC}$ or GND | 1.65 to 5.5 | | | ±5.0 | | ±10.0 | μA |
| $V_{OL}$ | Low−Level Output Voltage<br>$V_{IN}$ = $V_{IH}$ | $I_{OL}$ = 100 μA | 1.65 to 5.5 | | 0.0 | 0.1 | | 0.1 | V |
| | | $I_{OL}$ = 3 mA | 1.65 | | 0.08 | 0.24 | | | |
| | | $I_{OL}$ = 8 mA | 2.3 | | 0.22 | 0.3 | | 0.35 | |
| | | $I_{OL}$ = 12 mA | 2.7 | | 0.22 | 0.4 | | 0.45 | |
| | | $I_{OL}$ = 16 mA | 3.0 | | 0.28 | 0.4 | | 0.5 | |
| | | $I_{OL}$ = 24 mA | 3.0 | | 0.38 | 0.55 | | 0.65 | |
| | | $I_{OL}$ = 32 mA | 4.5 | | 0.42 | 0.55 | | 0.65 | |
| $I_{IN}$ | Input Leakage Current | $V_{IN}$ or $V_{OUT}$ = $V_{CC}$ or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA |
| $I_{OFF}$ | Power Off−Output Leakage Current | $V_{OUT}$ = 5.5 V | 0 | | | 1 | | 10 | μA |
| $I_{CC}$ | Quiescent Supply Current | $V_{IN}$ = $V_{CC}$ or GND | 5.5 | | | 1 | | 10 | μA |

## AC ELECTRICAL CHARACTERISTICS $t_R$ = $t_F$ = 2.5 ns; $C_L$ = 50 pF; $R_L$ = 500 Ω

| Symbol | Parameter | Condition | $V_{CC}$ (V) | $T_A$ = 25°C | | | −55°C ≤ $T_A$ ≤ 125°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $t_{PZL}$ | Propagation Delay (Figure 3 and 4) | $R_L$ = $R_1$= 5000 Ω, $C_L$ = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 2.5 ± 0.20 | 0.8 | 3.0 | 3.6 | 0.8 | 4.1 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 3.3 ± 0.30 | 0.8 | 2.4 | 3.2 | 0.8 | 3.7 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 5.0 ± 0.50 | 0.5 | 2.4 | 3.0 | 0.5 | 3.5 | |
| $t_{PLZ}$ | Propagation Delay (Figure 3 and 4) | $R_L$ = $R_1$= 5000 Ω, $C_L$ = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 2.5 ± 0.20 | 0.8 | 3.8 | 4.5 | 0.8 | 5.0 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 3.3 ± 0.30 | 0.8 | 2.9 | 3.2 | 0.8 | 3.7 | |
| | | $R_L$ = $R_1$= 500 Ω, $C_L$ = 50 pF | 5.0 ± 0.50 | 0.5 | 1.2 | 3.0 | 0.5 | 3.5 | |

## CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{CC}$ = 5.5 V, $V_I$ = 0 V or $V_{CC}$ | 2.5 | pF |
| $C_{OUT}$ | Output Capacitance | $V_{CC}$ = 5.5 V, $V_I$ = 0 V or $V_{CC}$ | 4 | pF |
| $C_{PD}$ | Power Dissipation Capacitance (Note 6) | 10 MHz, $V_{CC}$ = 5.5 V, $V_I$ = 0 V or $V_{CC}$ | 4 | pF |

7. $C_{PD}$ is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. $C_{PD}$ is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

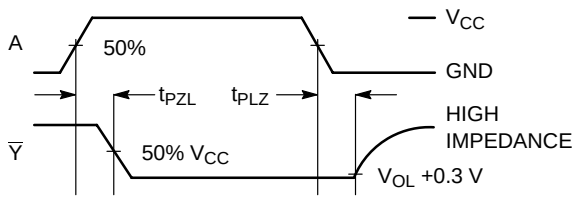
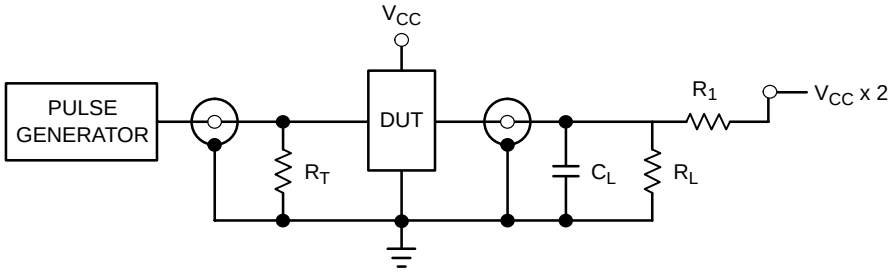



**Figure 3. Switching Waveforms**




$R_T$ = $Z_{OUT}$ of pulse generator (typically 50 Ω)

**Figure 4. Test Circuit**

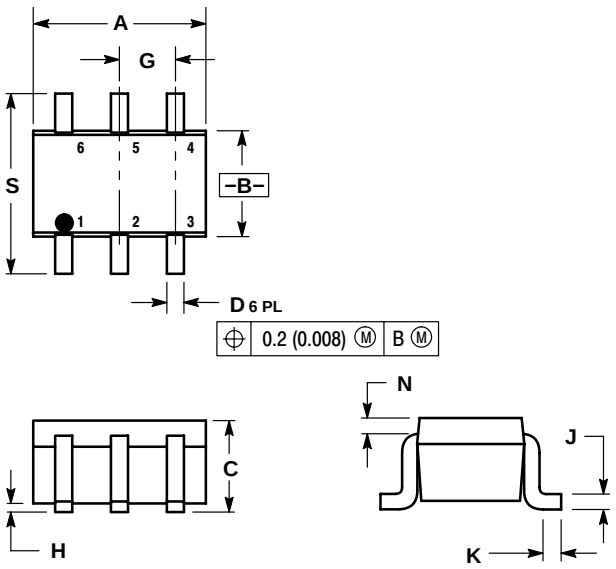
**ORDERING INFORMATION**

| Device | Device Nomenclature | | | | | | | Package | Shipping† |
|---|---|---|---|---|---|---|---|---|---|
| | Logic Circuit Indicator | No. of Gates per Package | Temp Range Identifier | Technology | Device Function | Package Suffix | Tape & Reel Suffix† | | |
| NL27WZ06DFT2 | NL | 2 | 7 | WZ | 06 | DF | T2 | SC−88 | 3000 / Tape & Reel |
| NL27WZ06DFT2G | NL | 2 | 7 | WZ | 06 | DF | T2 | SC−88 (Pb−Free) | 3000 / Tape & Reel |
| NL27WZ06DTT1 | NL | 2 | 7 | WZ | 06 | DT | T1 | TSOP−6 | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## PACKAGE DIMENSIONS

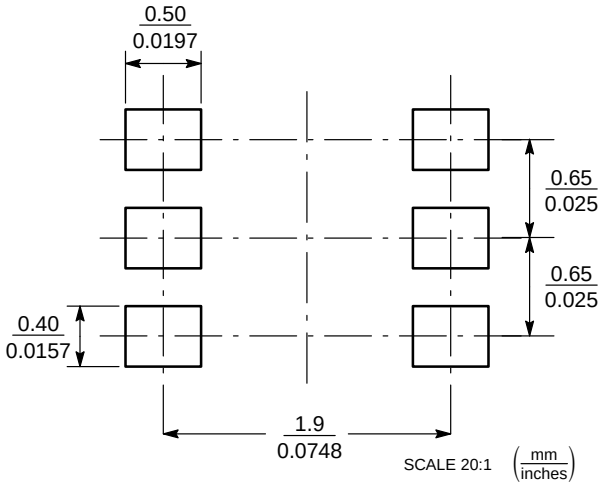
**SC−88/SC70−6/SOT−363**
CASE 419B−02
ISSUE U




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B−01 OBSOLETE, NEW STANDARD 419B−02.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| H | −−− | 0.004 | −−− | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF | | 0.20 REF | |
| S | 0.079 | 0.087 | 2.00 | 2.20 |

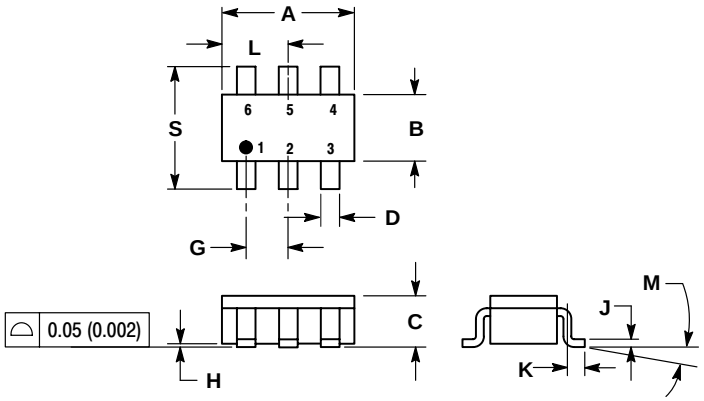
## SOLDERING FOOTPRINT*




*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## PACKAGE DIMENSIONS

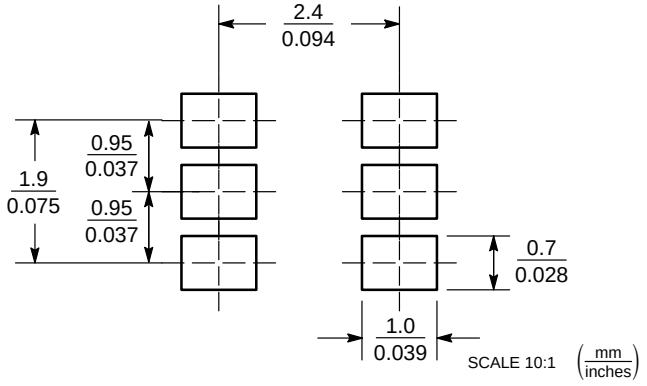
**TSOP−6**
CASE 318G−02
ISSUE L




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 2.90 | 3.10 | 0.1142 | 0.1220 |
| B | 1.30 | 1.70 | 0.0512 | 0.0669 |
| C | 0.90 | 1.10 | 0.0354 | 0.0433 |
| D | 0.25 | 0.50 | 0.0098 | 0.0197 |
| G | 0.85 | 1.05 | 0.0335 | 0.0413 |
| H | 0.013 | 0.100 | 0.0005 | 0.0040 |
| J | 0.10 | 0.26 | 0.0040 | 0.0102 |
| K | 0.20 | 0.60 | 0.0079 | 0.0236 |
| L | 1.25 | 1.55 | 0.0493 | 0.0610 |
| M | 0 ° | 10 ° | 0 ° | 10 ° |
| S | 2.50 | 3.00 | 0.0985 | 0.1181 |

## SOLDERING FOOTPRINT



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